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STEM FOR TOTAL HIP PROSTHESIS
[TIGE POUR PROTHESE TOTALE DE HANCHE]

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Description /2*

STEM FOR TOTAL HIP PROSTHESIS

The present invention concerns a stem for a total hip prosthesis; it also concerns hip prostheses equipped with such a stem.

As is known, a hip prosthesis essentially comprises three parts, that is, respectively:

- a femoral stem, also called the "stem", intended to be inserted into the femur;

- a cotyloid cup, also called the "cup", intended to be engaged in the cotyloid cavity of the respective hip;

- a prosthetic neck, capped with a sphere, intended to connect the stem and the cup in order thus to assure the articulation strictly speaking.

The stem is placed in the femur essentially by two techniques.

In the first technique, the stem is cemented. However, although used for a long time, this technique has per- and post-operative disadvantages capable of causing risks of infection. It also has risks of loosening during the course of wearing it and, finally, difficulties at the time of making repairs that can weaken the bone.

In the second, more recent technique, called "primary fixation", the stem is forcibly fixed in the bone, in particular by screwing (see, for example, EP-A-0190981). However, this technique has the disadvantage of causing post-operative pain resulting, it seems, from stress peaks formed at the level of the screw thread.

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*Numbers in the margin indicate pagination in the foreign text.

A total hip prosthesis femoral stem having primary fixation that has a slender longitudinal profile from the head to the tip and a general trapezoidal cross-section in which:

- on the one hand, the anterior curve of the stem, seen in a longitudinal plane, coincides with the curvature of the obturating curve of the femur relative to the cotyl in order to facilitate standardization;

- and, on the other hand, the proximal trochanter-diaphyseal portion of the head of the stem is widened in the antero-posterior plane.

As is known, the "obturating curve of the femur" is the ideal radiological line that extends from the pelvis to the femur and that corresponds to the upper part of the obturator foramen by continuing along the lower edge of the neck of the femur, then along the medial edge of the proximal femoral metaphysis.

In order to improve the primary stability of this stem, it has then been suggested that at least one groove, and preferably a plurality of parallel longitudinal grooves, be made on each of the two lateral faces. However, as it is known, in time, the osseous cavity into which the stem is inserted has a tendency to shrink and widen. It follows that the stem also has a tendency to descend into this cavity, therefore to move. At times this secondary instability requires a new operation.

The invention remedies these problems. It concerns a hip prosthesis stem that is well adapted to the shape of the hip to be

reinforced, in which the stress peaks are reduced, and that has excellent secondary stability, even over time.

This total hip prosthesis femoral stem having primary fixation, of the type having a longitudinal contour tapering from the head to the tip and a general trapezoidal section, and in which:

- on the one hand, the anterior curve of the stem, seen in a longitudinal plane, coincides with the curvature of the obturating curve of the femur relative to the cotyl;

- on the other hand, the proximal trochanter-diaphyseal portion of the head of the stem is widened in the antero-posterior plane,

wherein the trochanter-diaphyseal portion has two parallel, symmetrical longitudinal slots, open from the antero-posterior face to the anterior face.

Advantageously, these characteristic longitudinal slots have the general shape of fish gills so as to assure a certain elasticity and therefore better expansion after being put into place and thus to obtain good secondary stability, which previously could not have been obtained.

The general shape of the invented stem assures, as has already been said, good primary stability. The original characteristic of the gill-shaped longitudinal slots assures excellent secondary stability over time. Thus, although the osseous cavity has a tendency to expand, therefore to permit the stem to descend, the gill-shaped slots that have been tightened at the time of insertion, give elasticity to the whole, which assures a better fit against the osseous walls.

Thus, these gills can oppose this sliding movement by working together with the grooves.

Advantageously, in practice:

- the surface of the distal portion of the stem is smooth, which prevents stresses at the end of the stem;

- this femoral stem is made of a titanium alloy, in particular of the TA6V type, and the proximal portion is sanded so as to have a surface state formed of a plurality of fifty- to a hundred-micrometer microcavities, preferably on the order of eighty micrometer-microcavities, so as to assure good stability and good fixation without cement;

- the angle of the longitudinal axis of the stem with respect to the axis of the prosthetic neck (cervical-disphyseal angle) is close to 138°.

The manner in which the invention can be carried out and the advantages that come from it are best illustrated by the following embodiment, given as a non-limiting example, with reference to the appended figures.

Figure 1 is a front view of a total hip prosthesis having primary fixation according to the invention.

Figure 2 is a cross-section along axis AA of Figure 1. .

Figure 3 is a rear view of the stem according to the invention. /3

This stem, designated by the general reference number (1), is made of a metal alloy, in particular a titanium alloy, especially of the type TA6V, is tapered from the head (2) to the tip (3). In the

known way, the head (2) is continuously connected to the prosthetic neck (4) which ends in a fitting in the form of a truncated cone (5) on which the joint ball (6) comes to rest in the cup, not shown, and the angle of which at the top is close to 5°.

The outer surface of the distal portion (7) of the tip of the stem is smooth. This characteristic smooth portion (7) extends to around one third of the stem.

The anterior curvature of the stem designated by reference number (8), seen in a longitudinal plane, coincides with the curvature of the obturating curve of the femur with respect to the cotyle and is close to 138°C (angle alpha).

In the known way, the proximal trochanter-diaphyseal portion (9) of the heat of the stem (2) on the one hand, as is seen in Figure 3, is widened in the antero-posterior plane from the connection of the smooth portion (7) to the tip (2) and, on the other hand, has on its two main lateral faces (10, 11) a plurality of parallel longitudinal grooves (12) and (13). These grooves of equal depth and width, for example on the order of two millimeters, are of variable length from the posterior fact to the anterior face.

This proximal trochanter-diaphyseal portion (9) is advantageously sanded or coated with a plasma or porous or stippled deposit, so as to have a microporous surface state facilitating secondary stability, and the movement of the bone.

According to the characteristic of the invention (see Figures 2 and 3), the trpchanter-diaphyseal portion has two symmetrical parallel

longitudinal slots, respectively (14) and (15), in the shape of a fish gill, open from the antero-posterior fact (9) to the anterior face (8) so as to assure better expansion and to give elasticity at the time of placement.

At the time of placement, the flanges (16, 17) are compressed so as to tighten the slots (14, 15). When the stem is in place, the flanges are sequentially relaxed, then come to be blocked against the corticals, which assures optimal filling of the medullary canal and an excellent secondary stability.

As is seen in Figure 2, the cross-section of the stem is essentially degressively trapezoidal.

In a practical embodiment, the characteristic slots (14) and (15) are machined by fraising. The width of these slots varies from 1 to 2 mm, the depth from 49 to 63 mm, and the gill shape is saw-cut along a radius of 100 mm.

The stem according to the invention has numerous advantages with respect to those used up to now. Its ease of placement, absence of stress peaks, and a perfectly adapted anatomical shape and an excellent primary, and, especially, secondary stability may be cited, which could not be easily obtained up to now. Therefore it is perfectly suited as a hip prosthesis stem having primary fixation.

Claims

1. A femoral stem (1) of a total hip prosthesis having primary fixation, having a longitudinal contour tapering from the head (2) to the tip (3), and a general trapezoidal cross-section, and in which:

- on the one hand, the anterior curvature (8) of the stem (1), seen in a longitudinal plane, coincides with the curvature of the obturating curve of the femur relative to the cotyle;

- and on the other hand, the proximal trochanter-diaphyseal portion (9) of the head (2) of the stem (1):

- is widened in the antero-posterior plane,

- and has, on its two main side faces (10, 11), longitudinal grooves (12, 13),

wherein the trochanter-diaphyseal portion (9) has two parallel, symmetrical longitudinal slots (14, 15) open from the antero-posterior face (9) to the anterior face (8).

2. The femoral stem according to Claim 1, wherein the longitudinal slots (11, 15) have the general shape of fish gills.

3. The femoral stem according to one of Claims 1 and 2, wherein:

- the surface of the distal portion (7) of the tip (3) of the stem (1) is smooth;

- the longitudinal grooves (12, 13) are parallel to the axis of the stem, and have a variable width that decreases from the antero-posterior face (9) to the anterior face (8).

4. The femoral stem according to Claim 1, wherein the angle of the longitudinal axis of the stem (1) with respect to the axis of the prosthetic neck (4) is close to 138°.

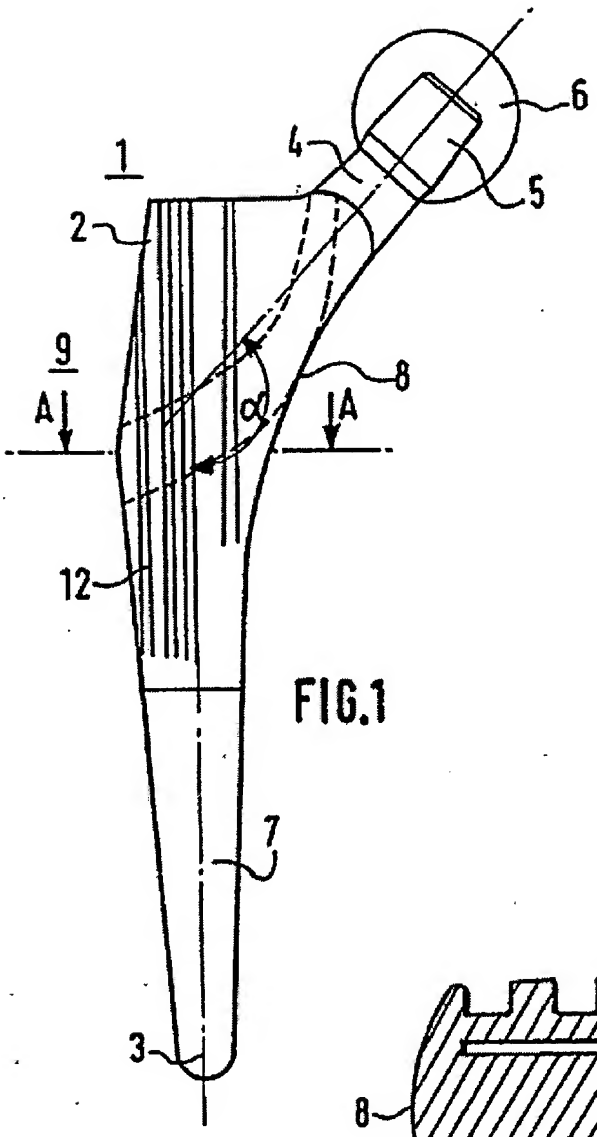

FIG.1

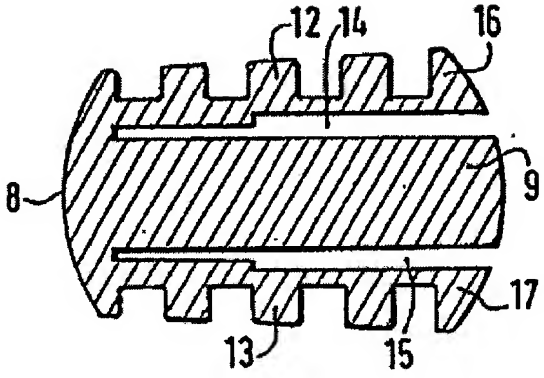

FIG.2

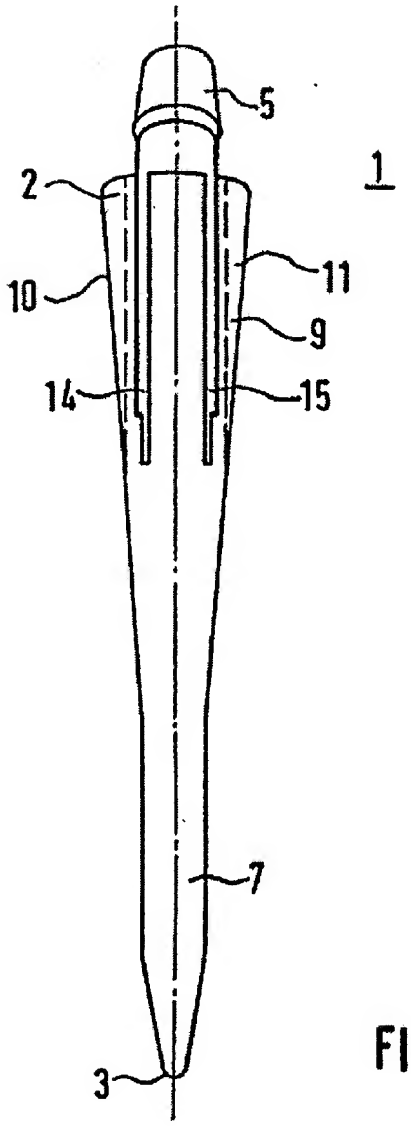

FIG.3